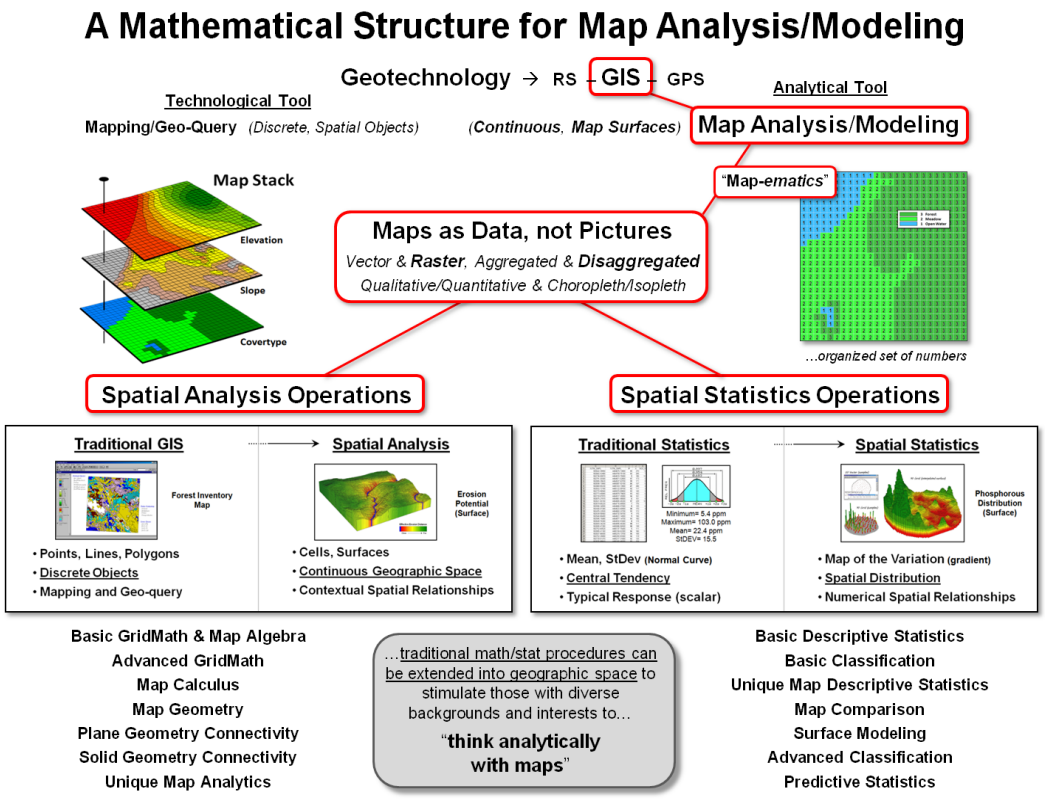
*Spatial*STEM:

A Mathematical Structure for Communicating and Teaching Fundamental Concepts in Spatial Reasoning, Map Analysis and Modeling

Presentation by **Joseph K. Berry**



The seminar describes the idea of ***Spatial*STEM for teaching spatial reasoning, map analysis and modeling fundamentals within a mathematical/statistical framework** that resonates with science, technology, engineering and math/stat communities. The premise is that "modern maps are numbers first and foremost, pictures later" and we do mathematical things to mapped data for insight and better understanding of spatial patterns and relationships within decision-making contexts— from *Where* is *What* graphical inventories to a *Why*, *So What* and *What If* problem-solving environments.

The map-*ematical* approach focuses on analytical tools used in spatial reasoning by non-GIS communities instead of traditional "GIS mechanics" of data acquisition, storage, retrieval, query and display of map features directed toward GIS specialists. The goal is to get the STEM communities to "think with maps" and infuse direct consideration of spatial patterns and relationships into their endeavors, as an alternative for spatially-aggregated math/stat procedures that assume uniform or random distribution of variables in geographic space.

Topics:

Quantitative Nature of Modern Maps – *conceptual approach, mathematical framework and data structure supporting a mathematical treatment of mapped data; grid-based data format uses Lat/Lon to form a Universal dB Key for joining data tables based on location*

Spatial Analysis Operations – *extensions of traditional mathematics that focus on "contextual" geographic relationships (e.g., map math, algebra, calculus, plane and solid geometry, and unique map analytics)*

Spatial Statistics Operations – *extensions of traditional statistics that focus on "numerical" relationships of map values (e.g., map descriptive statistics, normalization, comparison, classification, surface modeling, and predictive statistics)*

About the Presenter: Dr. Berry is a leading consultant and educator in the application of GIS technology. He is the principal of Berry and Associates // Spatial Information Systems (*BASIS*), consultants and software developers in geotechnology and the author of the "Beyond Mapping" column for GeoWorld magazine since 1989, several books and over 200 papers on GIS theory and applications. He conducted basic research and taught courses in GIS for twelve years at Yale University's Graduate School of Forestry and Environmental Studies, and is currently an adjunct faculty member in Geosciences at the University of Denver and in Natural Resources at Colorado State University.

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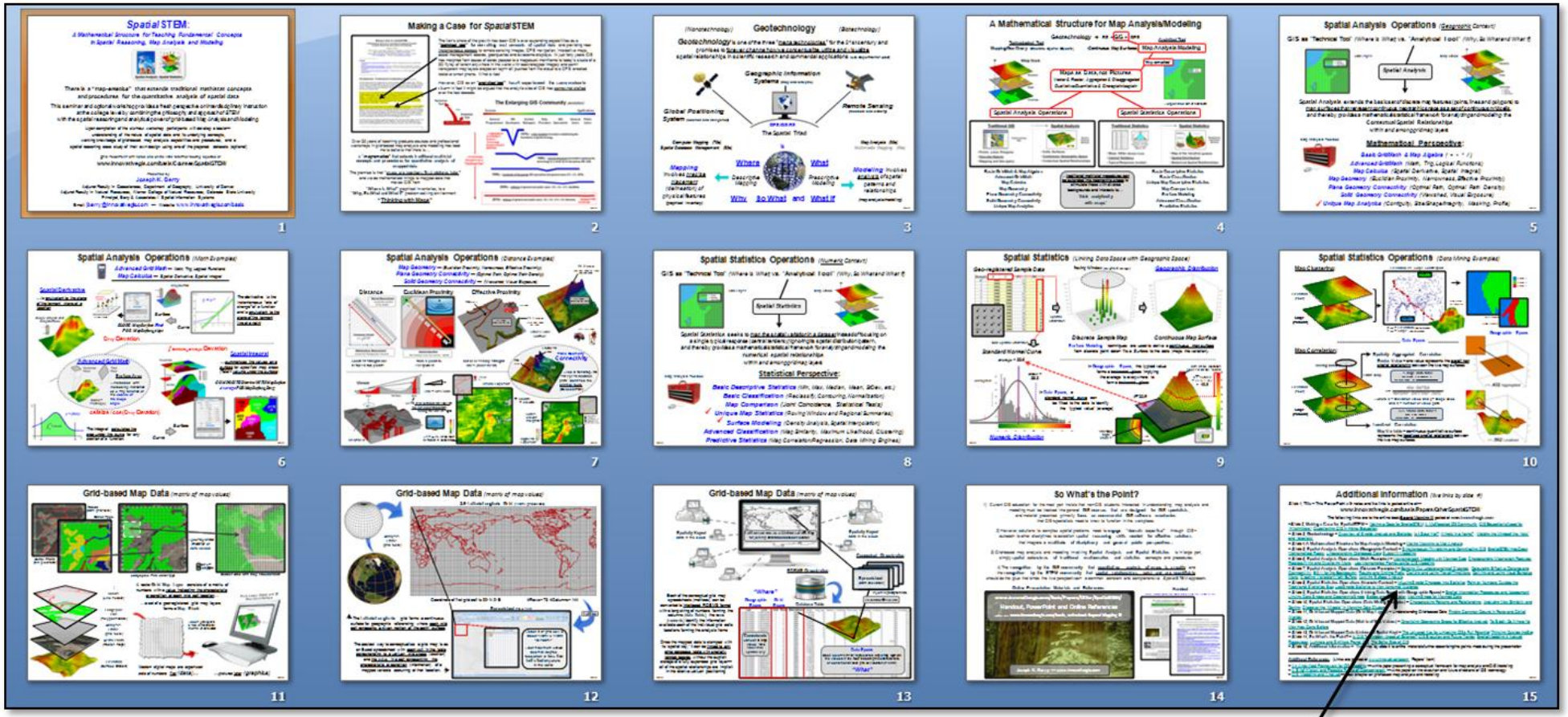
Additional Information:

- *Making a Case for SpatialSTEM — white paper describing a framework for grid-based map analysis and modeling concepts and procedures as direct spatial extensions of traditional mathematics and statistics.*
  http://www.innovativegis.com/basis/Papers/Other/SpatialSTEM/SpatialSTEM_case.pdf
- *SpatialSTEM: Extending Traditional Mathematics and Statistics to Grid-based Map Analysis and Modeling — white paper describing an innovative approach for teaching map analysis and modeling fundamentals within a mathematical/statistical context.*
  http://www.innovativegis.com/basis/Papers/Other/SpatialSTEM/
- *Beyond Mapping III — an online book containing Introduction, 28 Chapters and Epilog as a compilation of the popular Beyond Mapping columns published in GeoWorld magazine from 1996 through present, BASIS, Fort Collins, Colorado, 2012. J.K. Berry.*
  http://www.innovativegis.com/basis/MapAnalysis/

PowerPoint and materials used in the presentation are posted at ***www.innovativegis.com/basis/Courses/SpatialSTEM/***



www.innovativegis.com/basis/Papers/Other/SpatialSTEM/

Handout, PowerPoint and Online References

...also see **www.innovativegis.com/basis**, online book **Beyond Mapping III**

Last slide has "**live links**" by slide # to online materials further describing the points made during the presentation